



# **Peroneal Neuropathy: What To Do With It?**

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# Goal of the Lecture

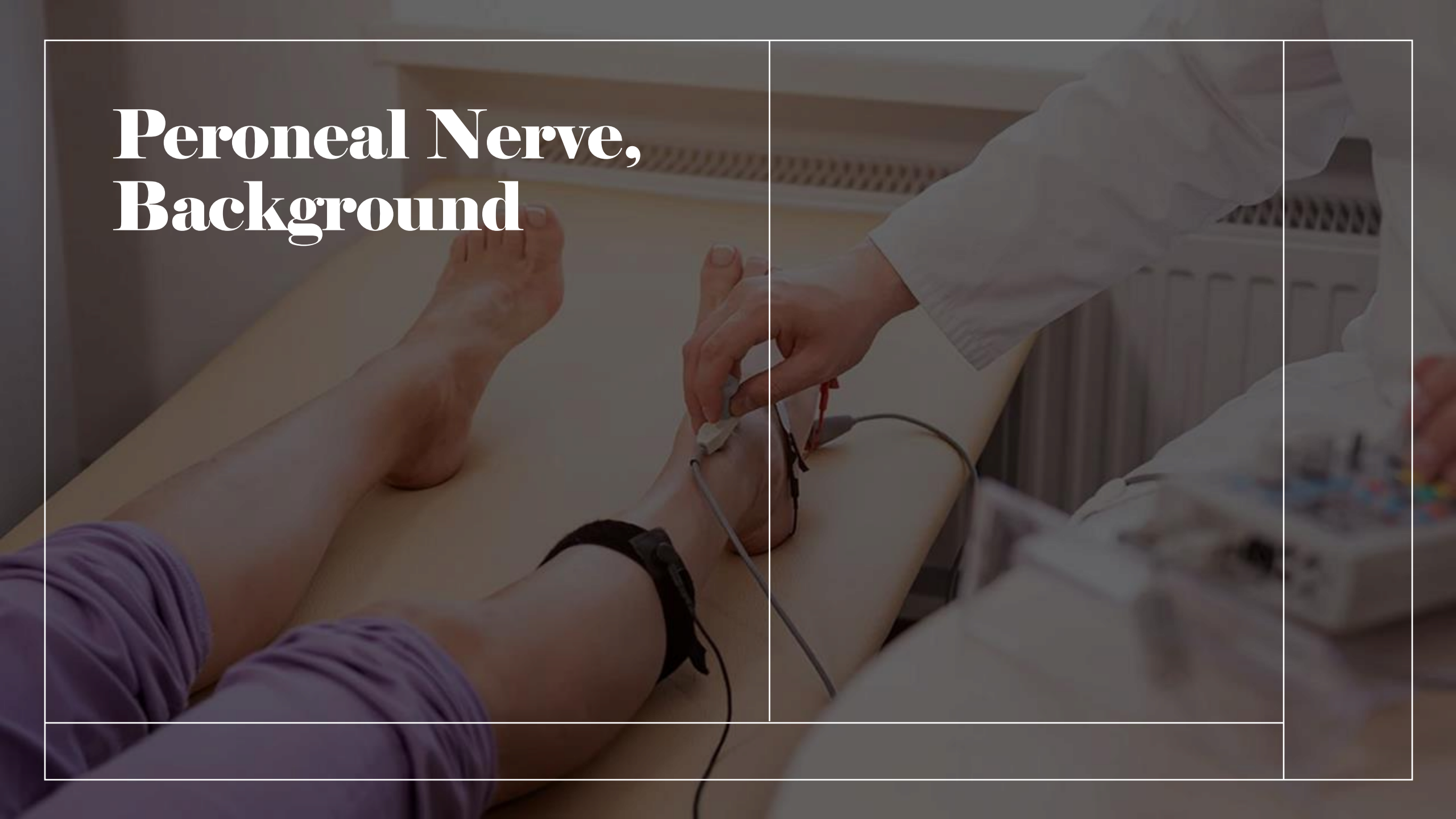
- We will review Peroneal Neuropathy from a diagnostic lens.
- We will also familiarize you with Electrodiagnostic Studies and Neuromuscular Ultrasound, but not expand your scope of practice.

# Overview

A photograph of a person's leg and foot being examined by a healthcare professional in a clinical setting. The person is lying on a table, and the healthcare professional is wearing a white coat and is using a device to examine the foot. The background is a clinical setting with a white wall and a vent.

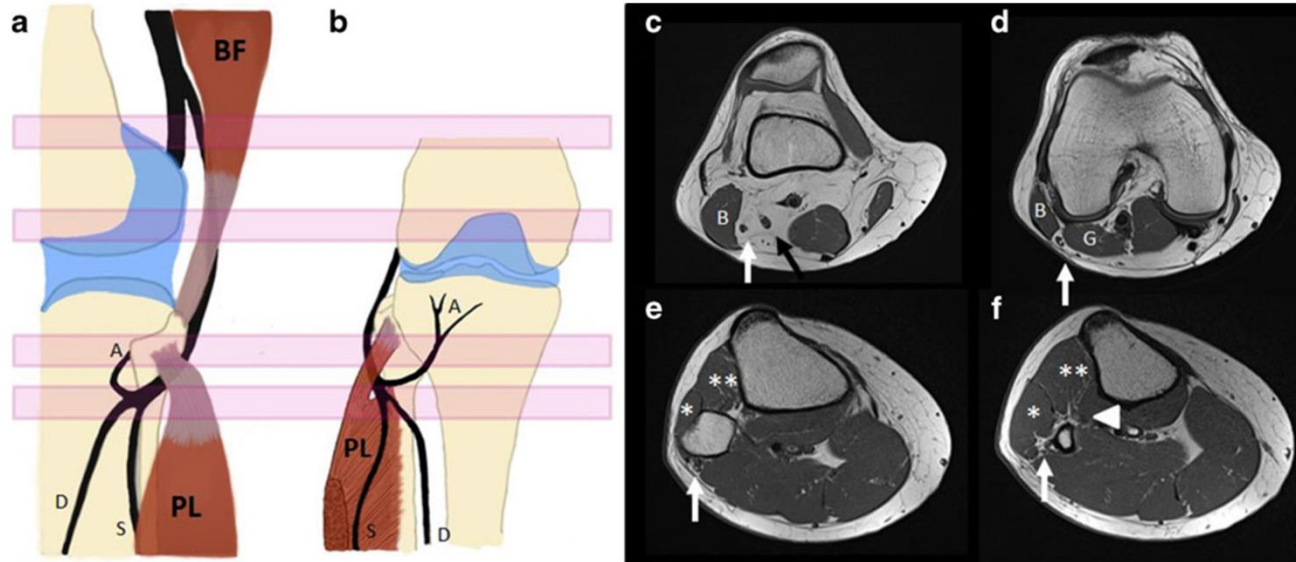
- Peroneal Nerve, Background
- Peroneal Nerve, Anatomy
- Foot Drop, Neuropathic Differential Diagnosis
- Peroneal Neuropathy, Diagnostics and Treatment
- Electrodiagnostics, Brief Overview
- Nerve Damage Basics
- Neuromuscular Ultrasound, Correlations
- Practical Approach to Mononeuropathy

# Peroneal Nerve, Background





Van den Bergh et al 2013



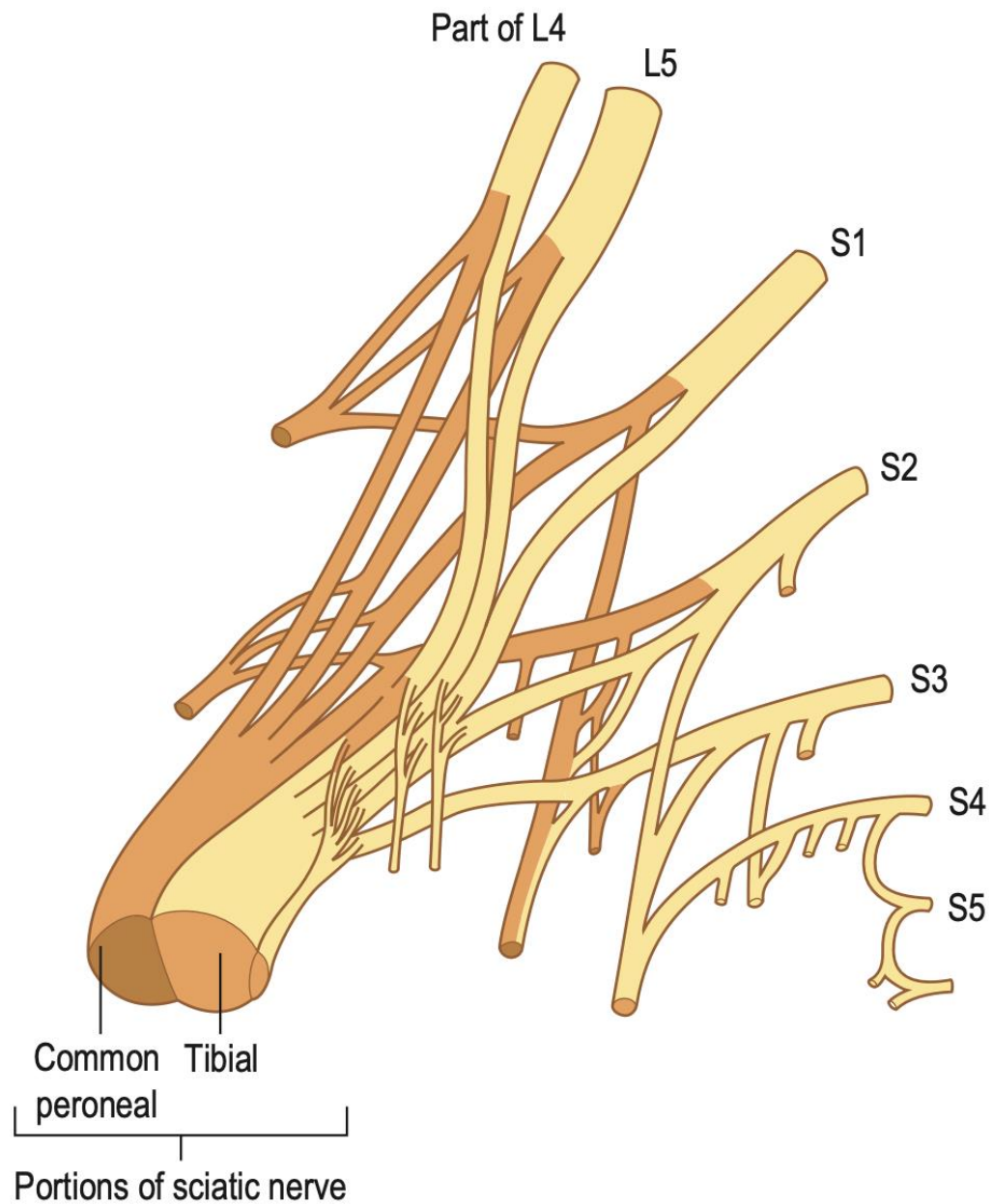
- Most common Mononeuropathy in the Lower Extremity
- Usually injured at the Fibular Neck
- Clinical Symptoms
  - Foot Drop
  - Sensation Loss
    - Lateral Calf and Dorsal Foot
- Differential
  - Sciatic Neuropathy, Lumbosacral Plexopathy, or L5 Radiculopathy

# Peroneal Nerve, Background

# Peroneal Nerve, Anatomy

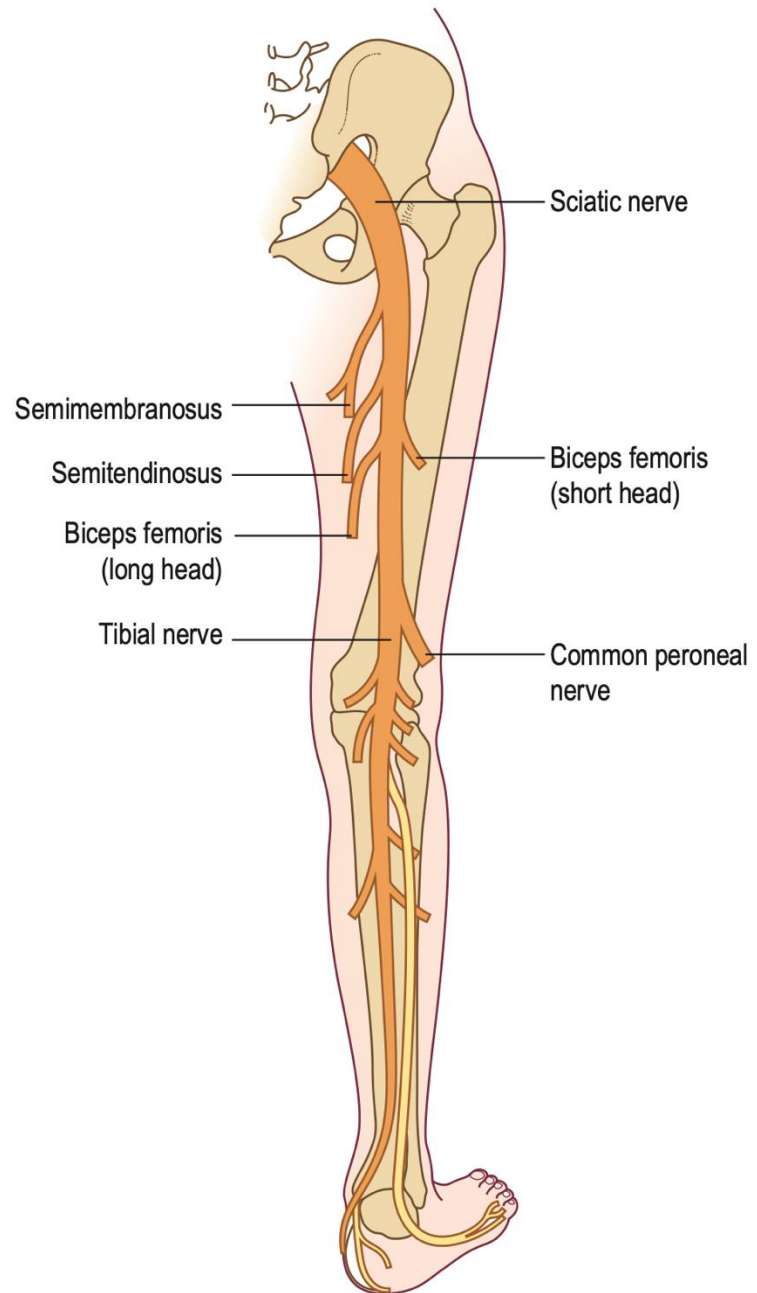


- Lumbosacral Plexus
- Sciatic Nerve
- Common Peroneal Nerve
- Deep Peroneal Nerve
- Superficial Peroneal Nerve



# Peroneal Nerve, Anatomy

- Roots
  - L4, L5, S1, S2
- Lumbosacral Plexus
  - Posterior divisions of the anterior rami
- Sciatic Nerve
  - Fibers differentiate within the nerve
    - Lateral Aspect = Common Peroneal Nerve
    - Medial Aspect = Tibial Nerve



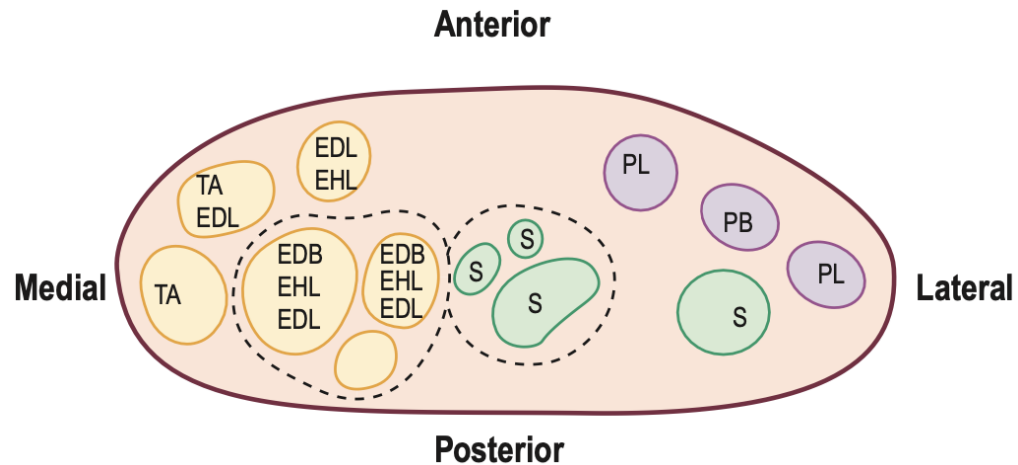
Preston and Shapiro 2013

# Peroneal Nerve, Anatomy

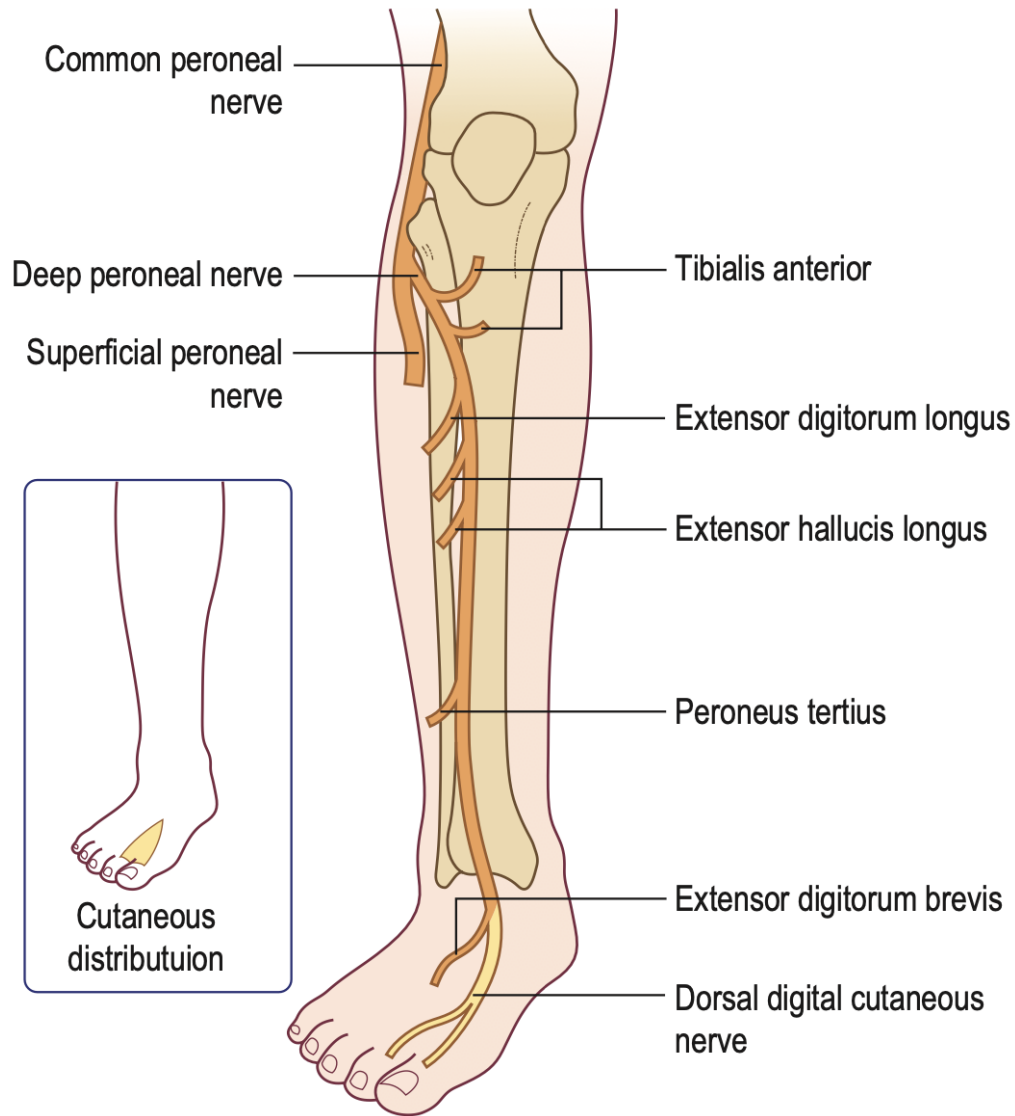
- **Biceps Femoris (Short Head)**
  - ONLY Peroneal-derived muscle above the level of the fibular neck.
- **Sciatic Nerve**
  - Bifurcates above the Popliteal Fossa into the Tibial and Common Peroneal Nerves.
- **Lateral Cutaneous Nerve of the Knee**
  - Branches PRIOR to winding around the fibular neck and passing through the fibular tunnel
    - Between Peroneal Longus and Fibula



# Peroneal Nerve, Anatomy



- Common Peroneal Nerve's internal fascicular anatomy
  - At the level of the fibular neck
  - Prior to bifurcation into the Deep and Superficial Branches
- Medial = Deep Peroneal Nerve
- Lateral = Superficial Peroneal Nerve

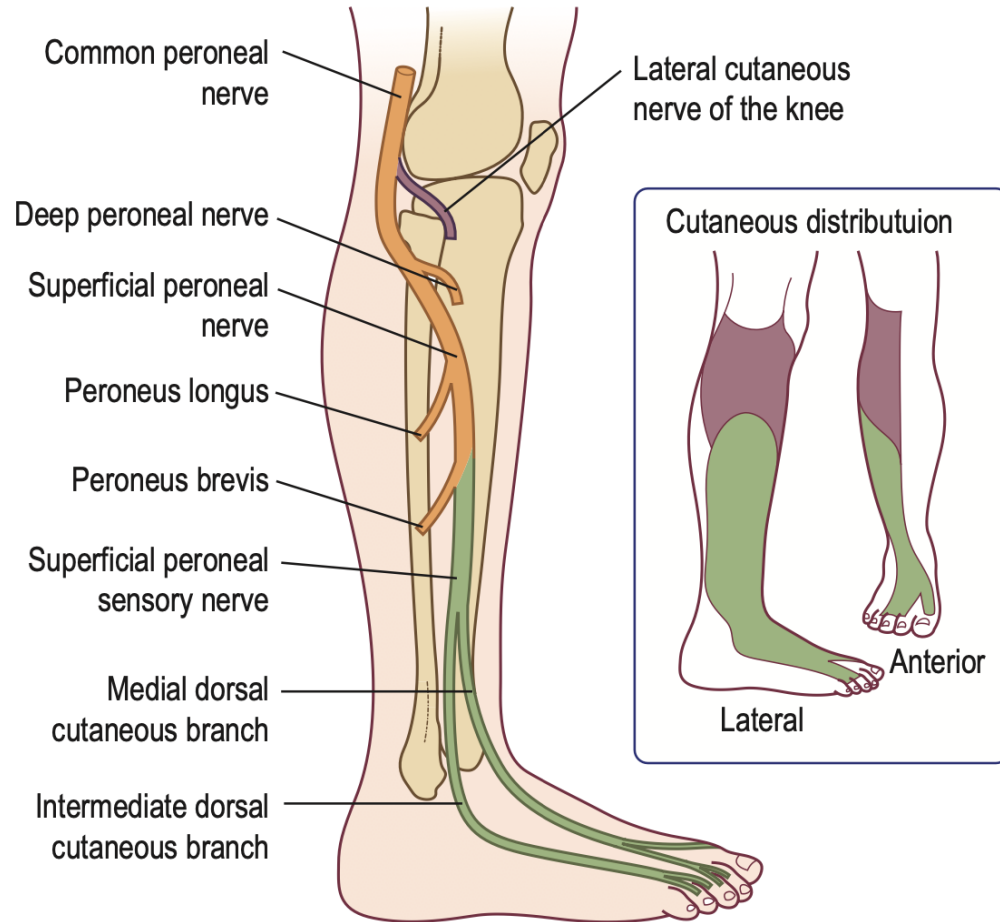


Preston and Shapiro 2013

# Peroneal Nerve, Anatomy

- Deep Peroneal Nerve
  - Motor
    - Dorsiflexion of Ankle and Toe
    - Peroneus Tertius
      - Dorsiflexion plus Eversion
  - Sensation
    - First Dorsal Web Space

# Peroneal Nerve, Anatomy

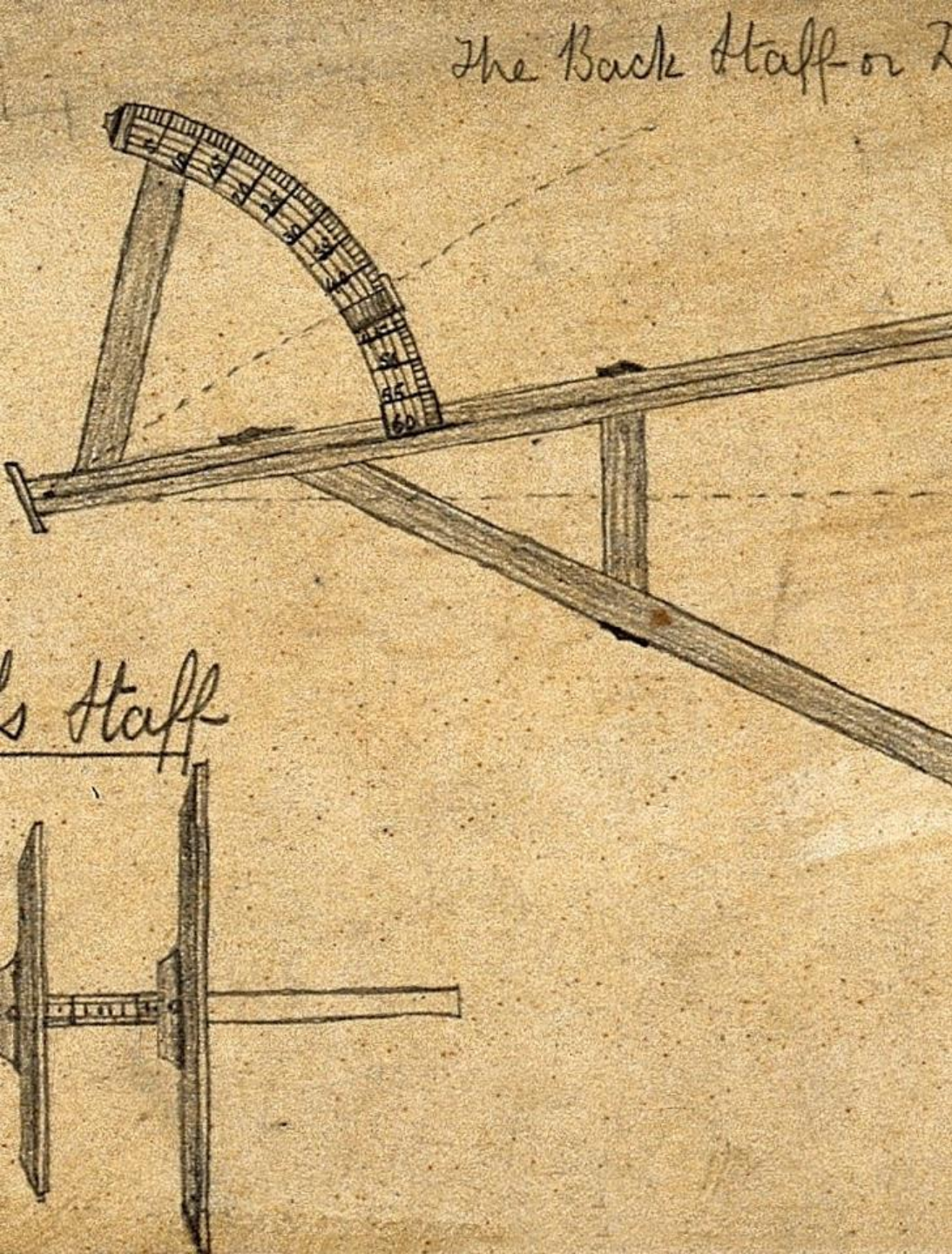


- Superficial Peroneal Nerve
  - Motor
    - Eversion of Ankle
  - Sensation
    - Mid and Lower Lateral Calf
    - Medial and Intermediate Dorsal Cutaneous Nerves of the Foot
      - Dorsal Foot and Medial 3-4 Toes (not past the Interphalangeal Joints)

# Foot Drop, Neuropathic Differential Diagnosis



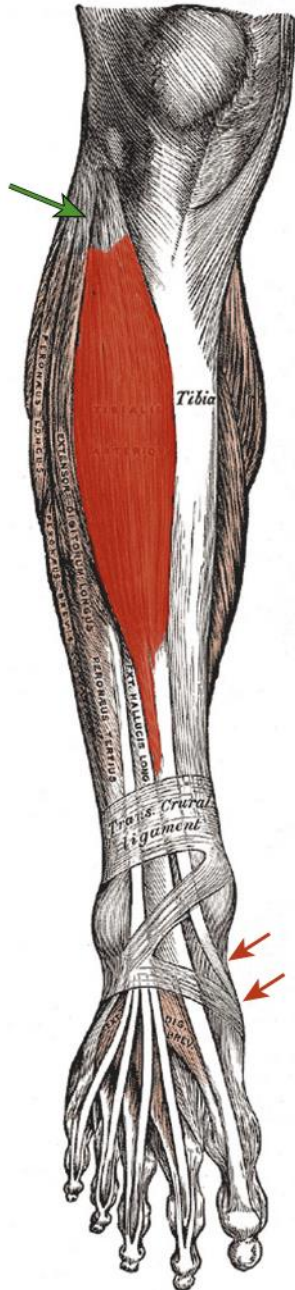




# Foot Drop's Neurogenic Differential

- Deep Peroneal Nerve
- Common Peroneal Nerve
- Sciatic Nerve
- Lumbosacral Plexus
- L5 Root



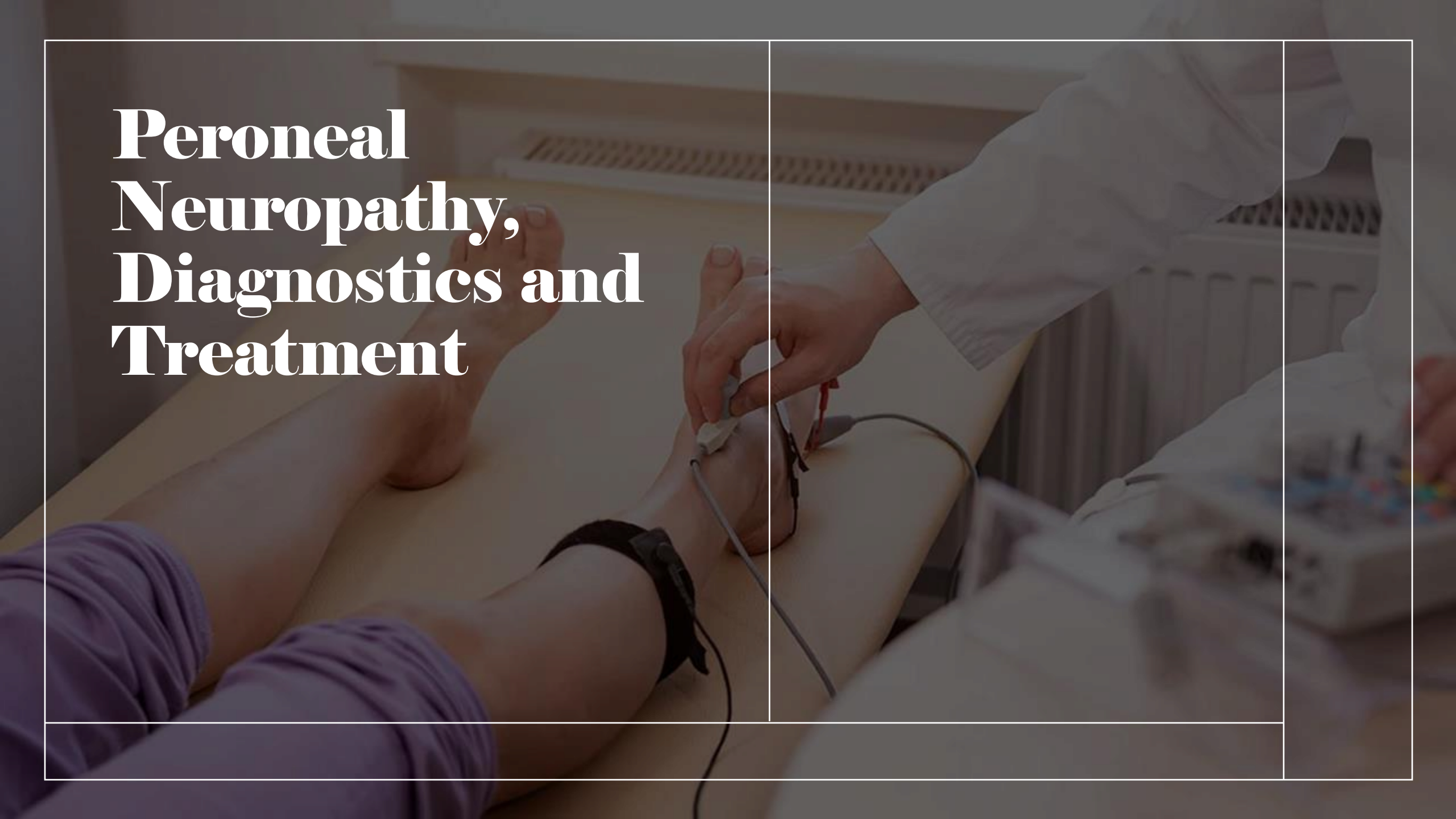


Gray 1918

# Foot Drop Pitfalls

- Inversion Strength Testing in Foot Drop
  - Mechanical Disadvantage
  - Tibialis Anterior insertion

# Peroneal Neuropathy, Diagnostics and Treatment



# **Peroneal Neuropathy, Diagnostics**

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X-Ray

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MRI

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Ultrasound

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Electrodiagnostics

# **Peroneal Neuropathy, Treatment**

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Prevention

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Orthotics

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Physical Therapy

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Surgery

# Electrodiagnostics, Brief Overview







Localization



Severity



Prognosis

**Electrodiagnostics, Goal**

# Electrodiagnostic Studies (EDX)



## Nerve Conduction Studies (NCS)

Performed with a probe.  
Testing Nerve Fiber integrity.



## Electromyography (EMG)

Performed with a needle.  
Testing Nerve Muscle interface integrity.



# Which patients should you send?

- Patients suffering from:
  - Numbness
  - Tingling
  - Pain
  - Weakness
  - Muscle Cramping
  - Atrophy
- Timing
  - Chronic, immediately
  - Acute, after 3 weeks

# How should your patient prepare?



Arrive early.



Take a shower to wash off oils and avoid lotions/moisturizers the day of the procedure.



Wear warm clothing.

# Ideal Consult

- Clear, pertinent, and concise one liner
  - Diagnosis or Differential
  - Surgical considerations
  - Goals
  - Questions

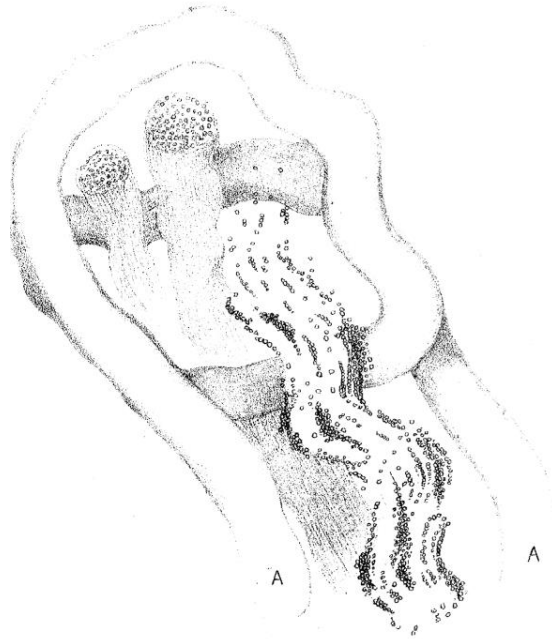




# Nerve Damage Basics

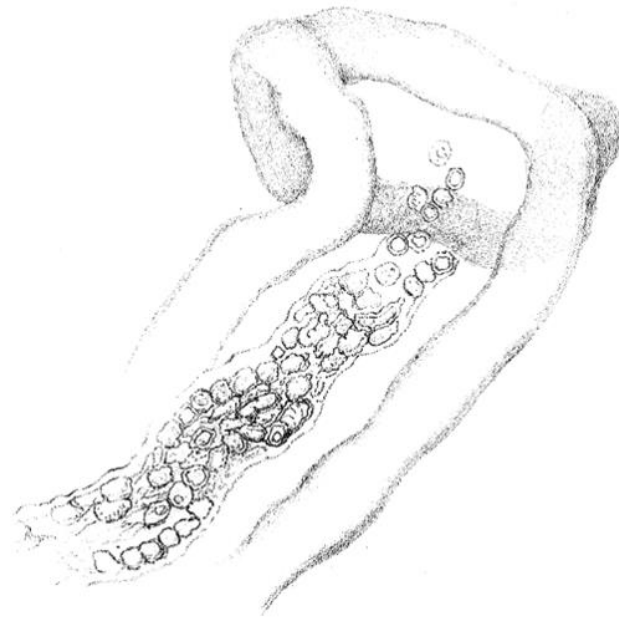


*Fig. 2.*



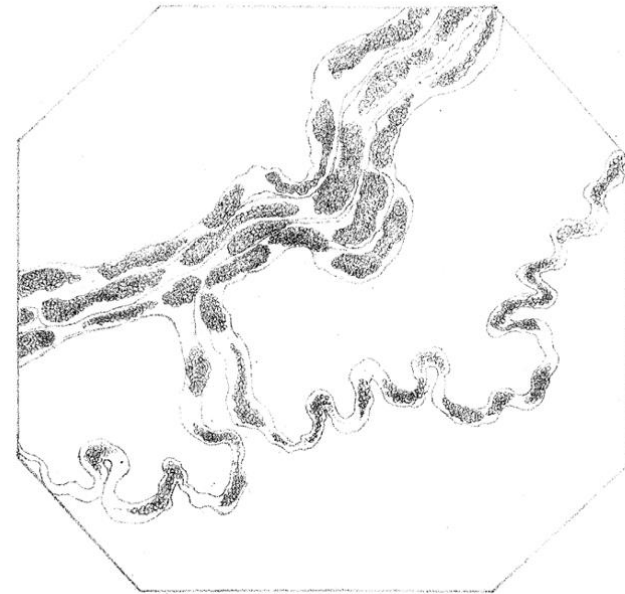
*Magnified 400 diam<sup>rs</sup>*

*Fig. 1.*



*Magnified 400 diam<sup>rs</sup>*

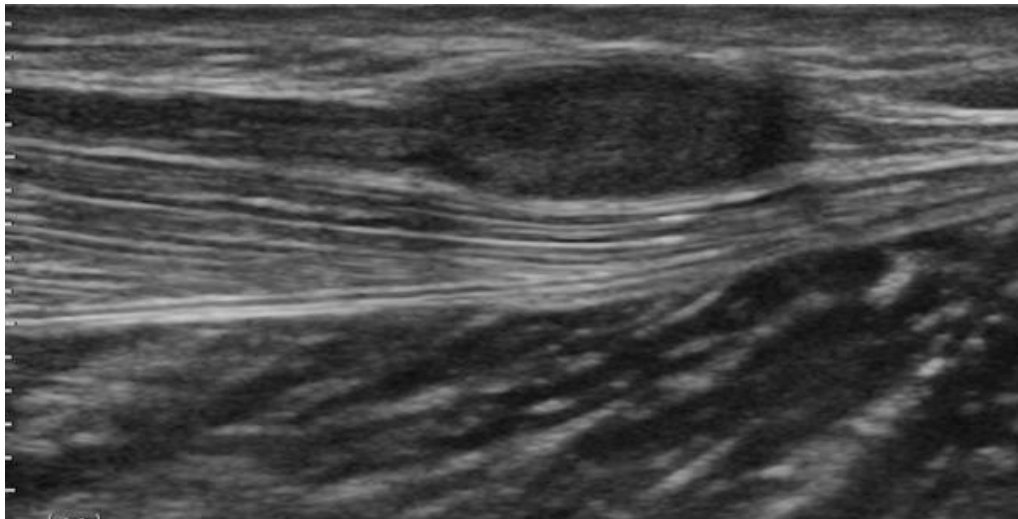
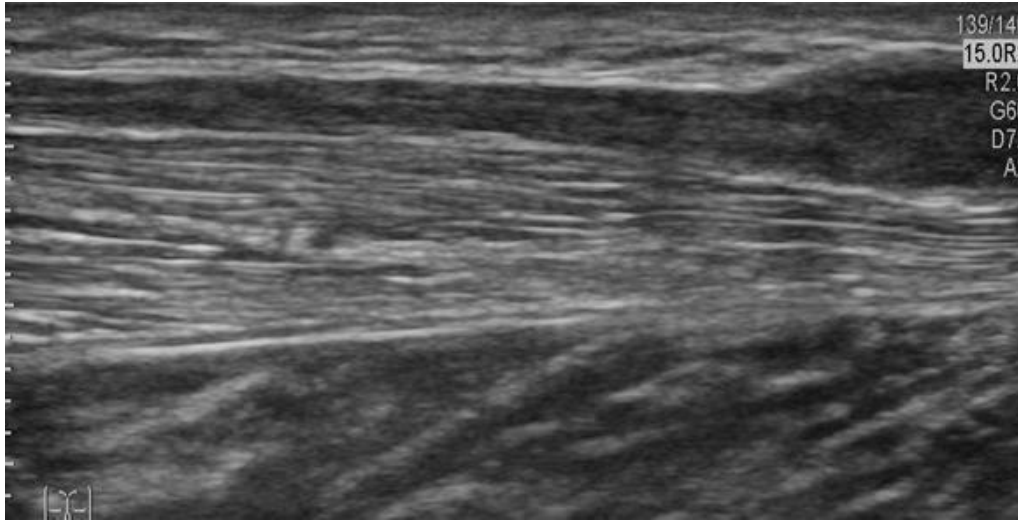
*Fig. 3.*



*Mag<sup>d</sup> 400 diam<sup>rs</sup>.*

# Nerve Damage Basics

Wallerian  
Degeneration



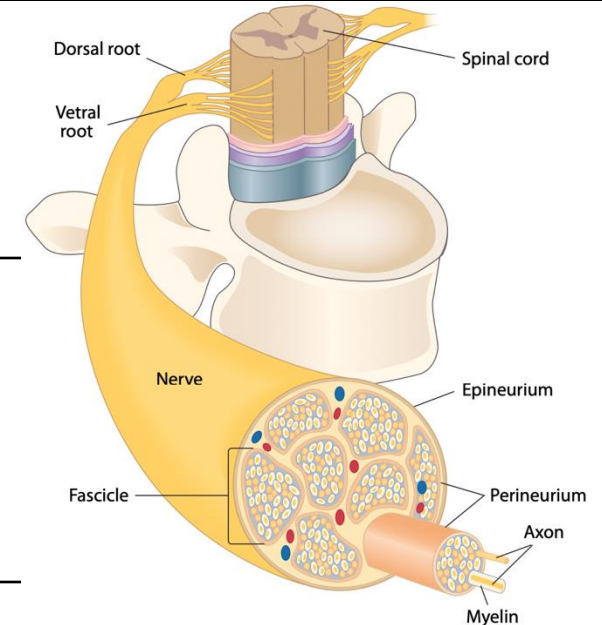
# Nerve Recovery

- Conduction Block resolution
- Collateral Sprouting
- Axonal Degeneration

**Nerve Injury Classification**

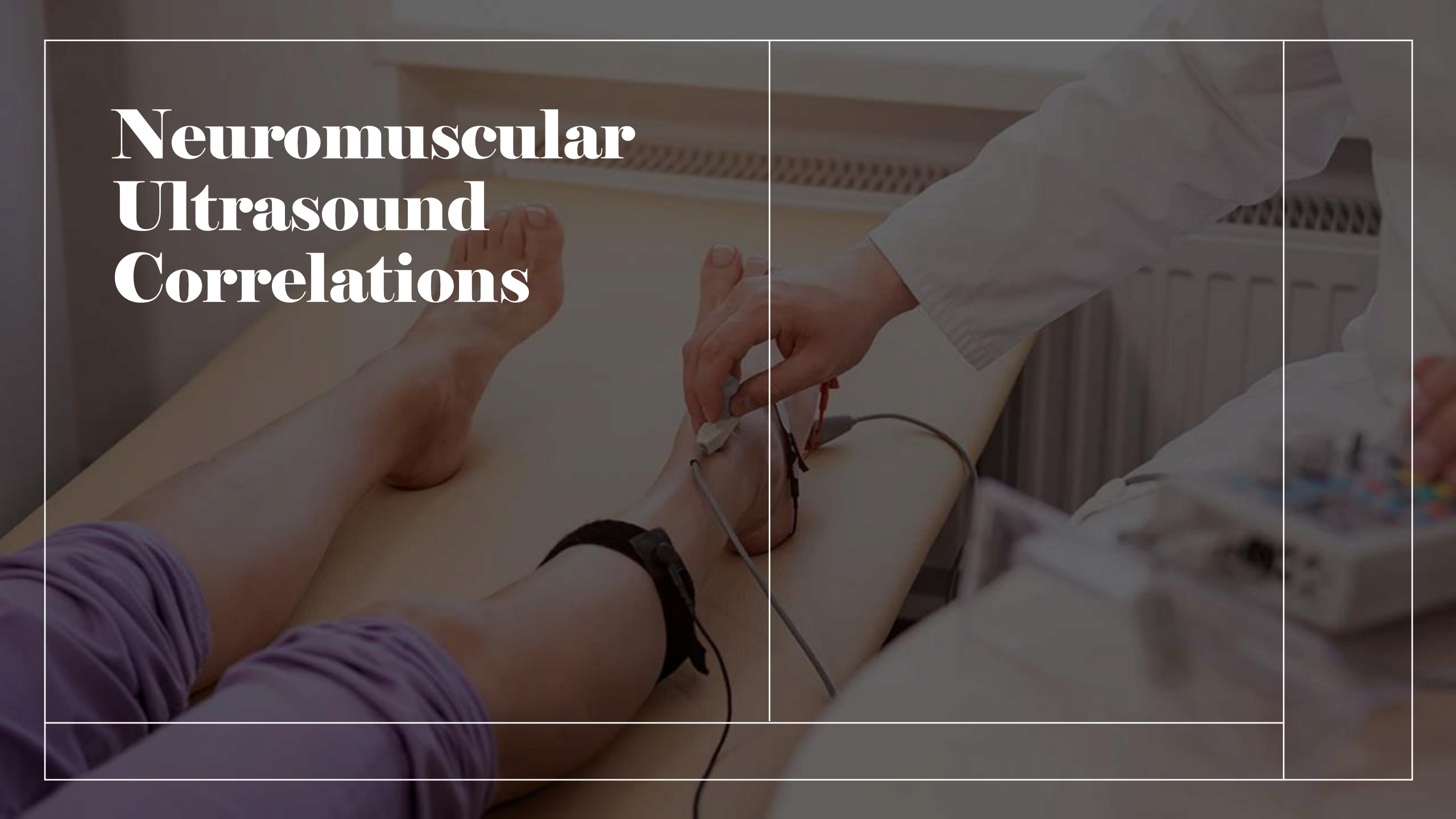
<b>Seddon</b>	<i>Neuropraxia</i> Compression		<i>Axonotmesis</i> Crush		<i>Neurotmesis</i> Transection		
<b>Sunderland</b>	<b>I</b> Conduction Block		<b>II</b> Axonal Injury	<b>III</b> plus Endoneurial Injury	<b>IV</b> plus Perineurial Injury	<b>V</b> plus Epineurial Injury	
<b>Description</b>	Local myelin damage		Axon continuity is lost ∴ Wallerian Degeneration occurs				
<b>Prognosis</b>	Spontaneous recovery (days to weeks) Favorable		Full recovery possible without surgery (regeneration 2-3 mm per day)		Scar hinders axonal growth (regeneration 1 mm per day) typical to break scar build up	Surgical reconstruction Unfavorable	
<b>Nerve Conduction Studies</b>		<b>DISTAL Waveform</b>	<b>PROXIMAL Waveform</b>	<b>DISTAL Waveform</b>	<b>PROXIMAL Waveform</b>	<b>DISTAL Waveform</b>	<b>PROXIMAL Waveform</b>
	<i>Immediate</i>	Normal	Abnormal	<i>Immediate</i>	Normal	Abnormal	Abnormal
	<i>2 Weeks</i>	Normal	Abnormal	<i>2 Weeks</i>	Abnormal	Abnormal	Abnormal
	<i>&gt;2 Weeks</i>	Normal	Normal	<i>Weeks to Months</i>	Normal	Normal	Abnormal
<b>Electromyography</b>	Recruitment is either normal or decreased			Abnormal activity		Abnormal activity	

# Classification of Nerve Injury



Grahn-Shahar 2021

# Neuromuscular Ultrasound Correlations



# Ultrasound Correlations

- Neuromuscular Ultrasound for Peroneal Neuropathy
  - Non-localizing on Electrodiagnostics
  - Without obvious cause
  - Following Trauma

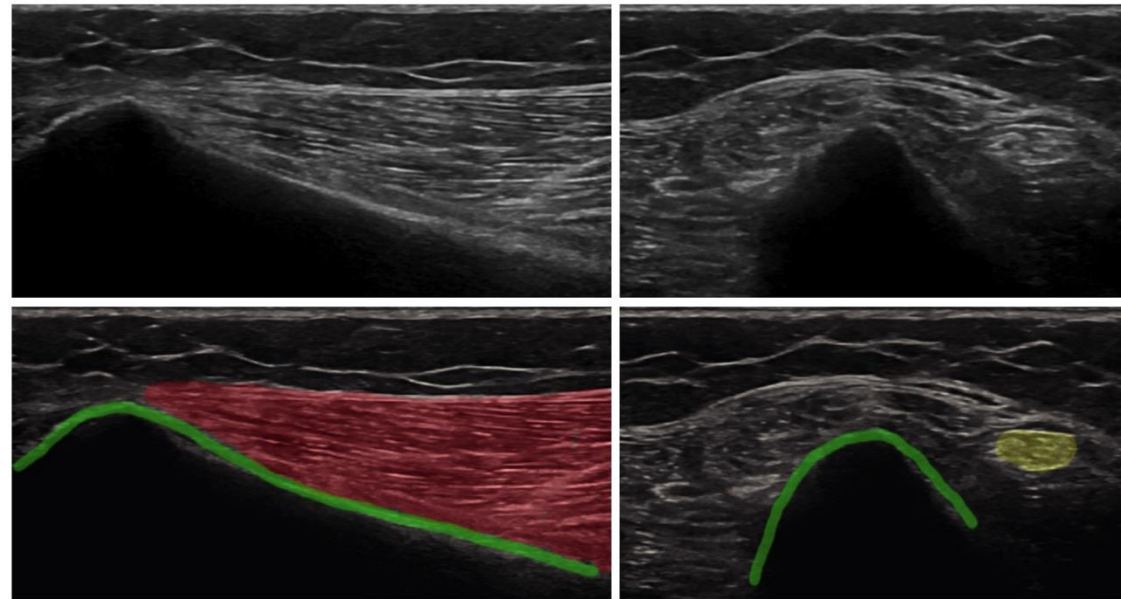


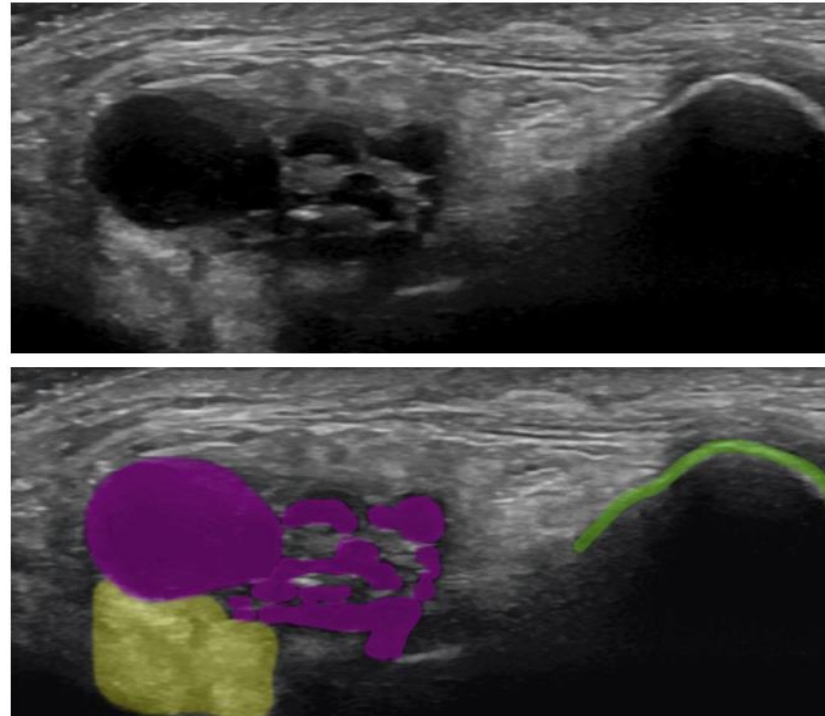
Fig. 25.15 Fibular head and neck. *Top*, Native images. *Bottom*, Same images with the bony outline of the fibular head and neck in *green*, the peroneal nerve in *yellow*, and the peroneus longus muscle in *red*. *Left*, Long axis. *Right*, Short axis. In long axis, the bony outline of the fibula is easily seen. Proximally, the fibular neck enlarges into the fibular head with the peroneus longus muscle directly above. In this position, when the probe is rotated 90° into short axis, the fibular head/neck is easily seen with the common peroneal nerve directly behind it.

Preston and Shapiro 2021



# Ultrasound Correlations

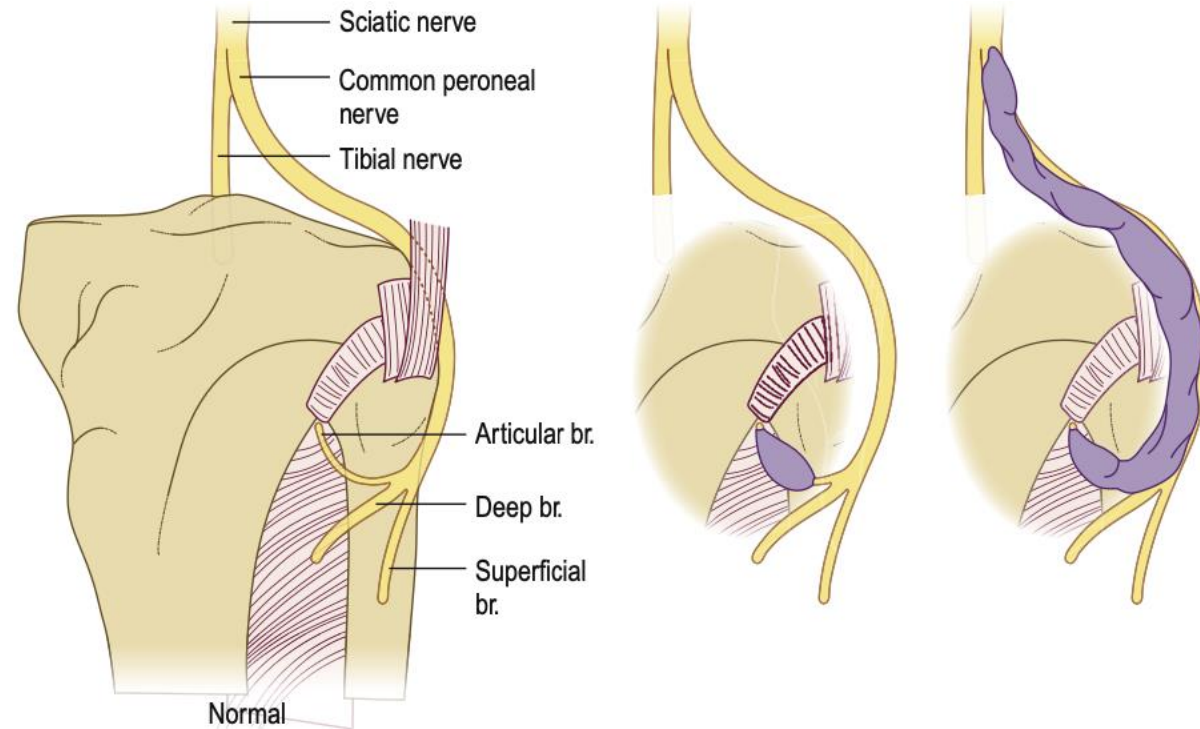
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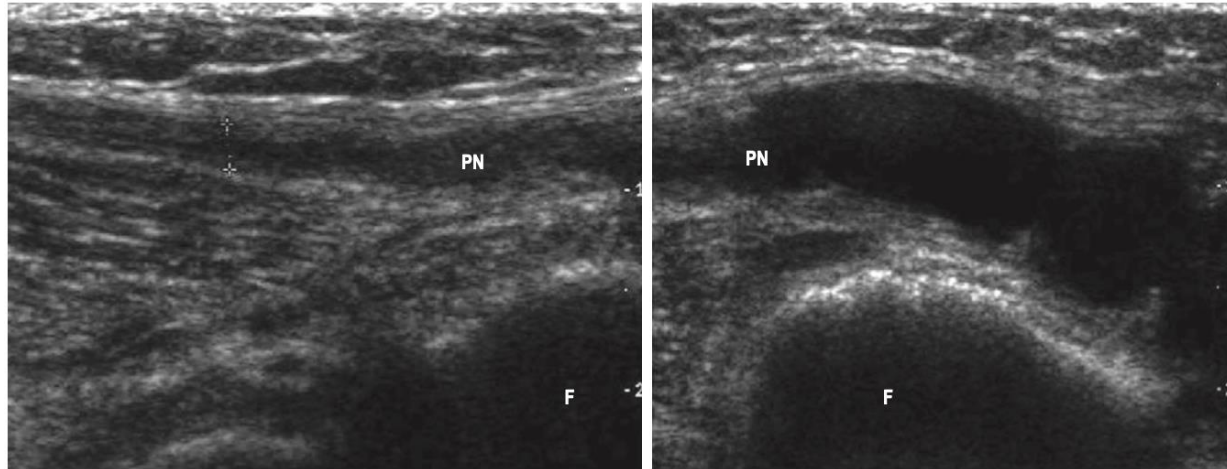
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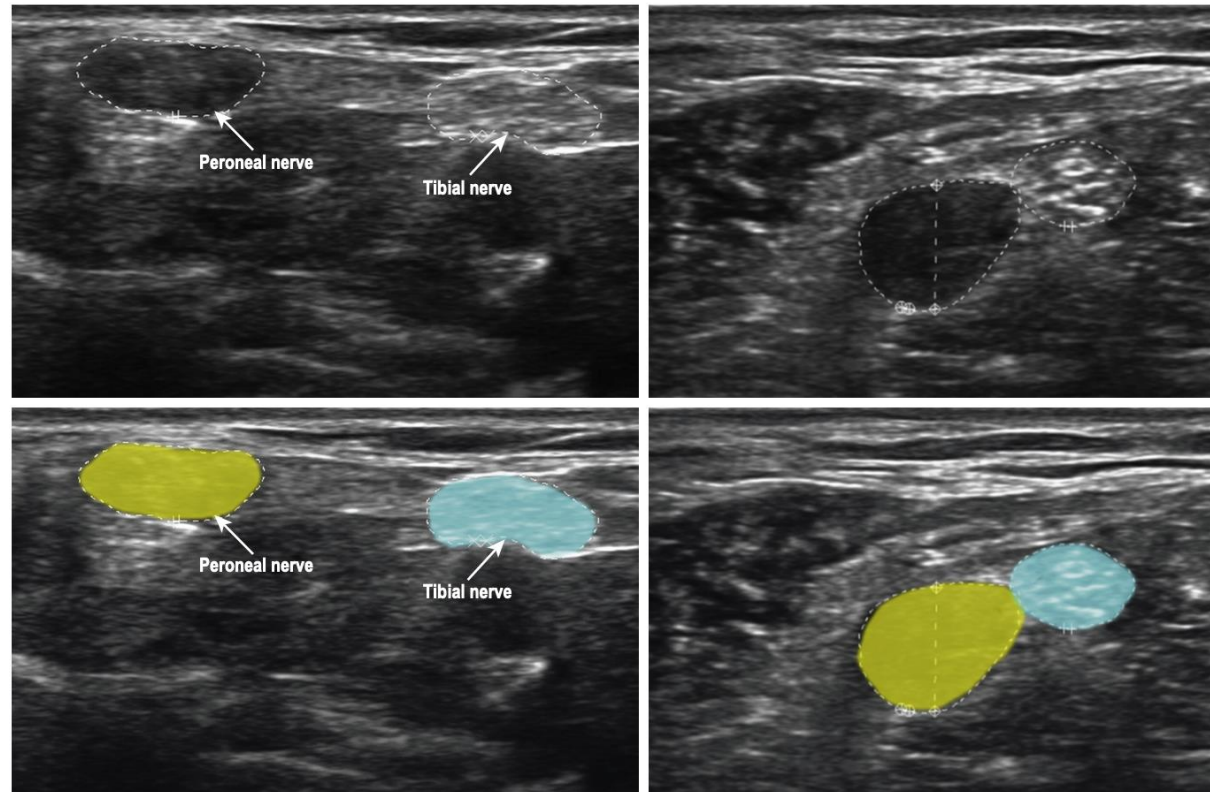
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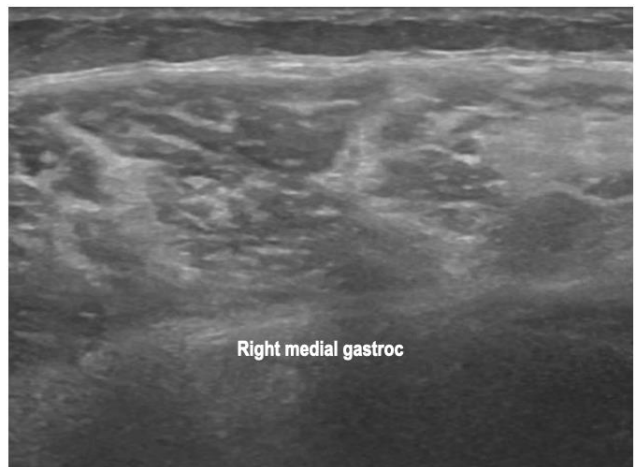
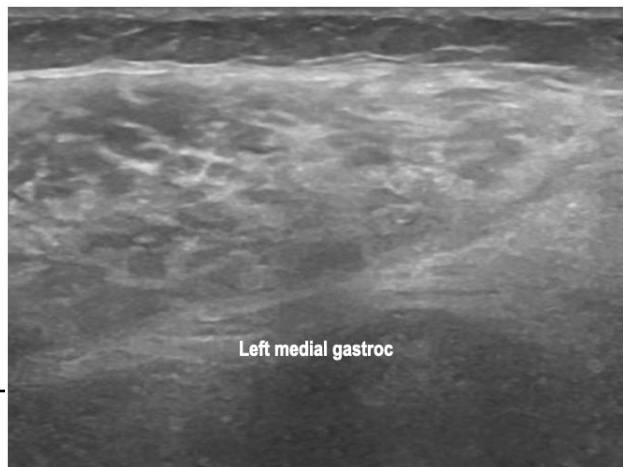
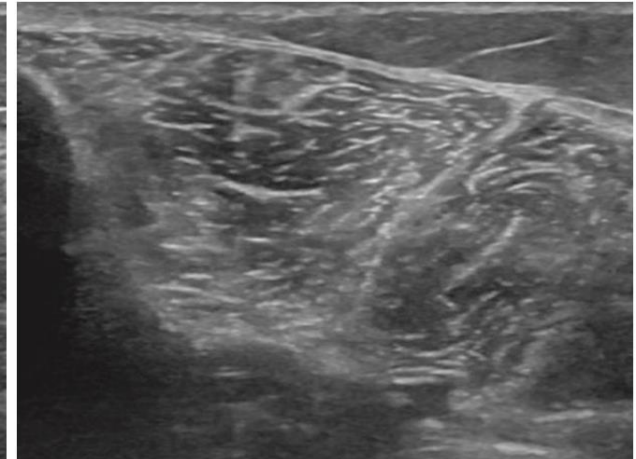
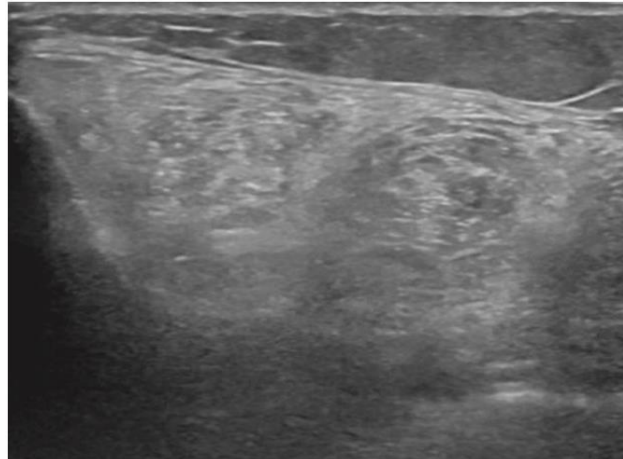
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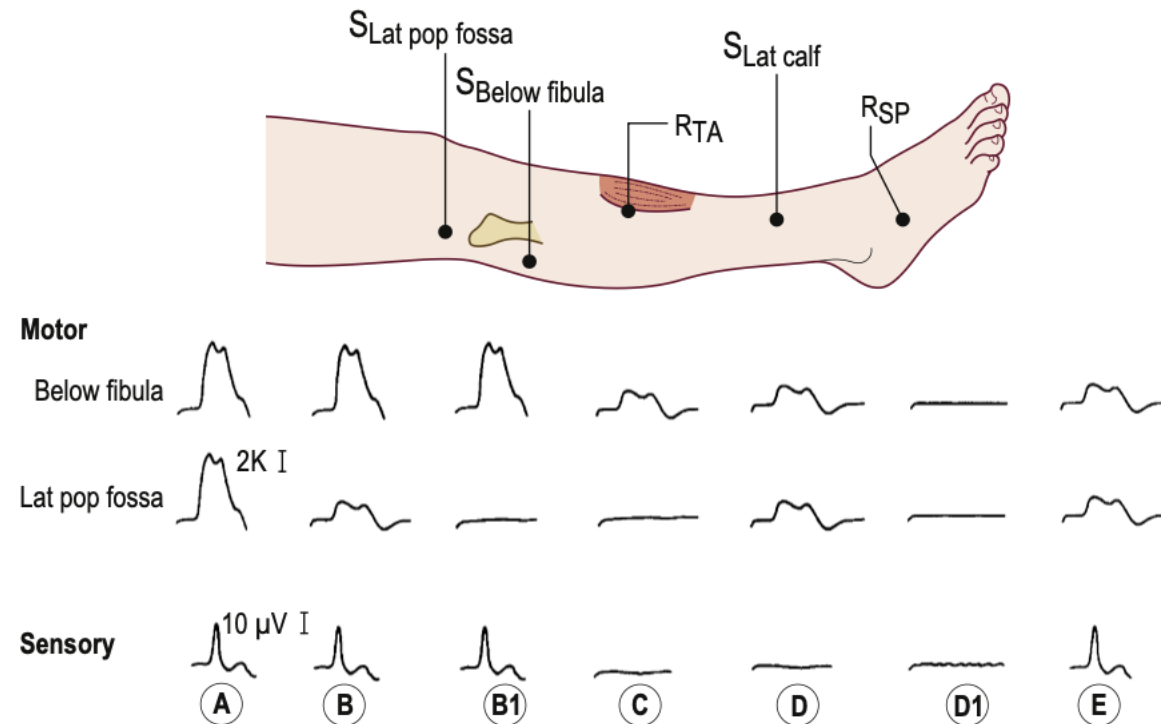
# Practical Approach to Mononeuropathy





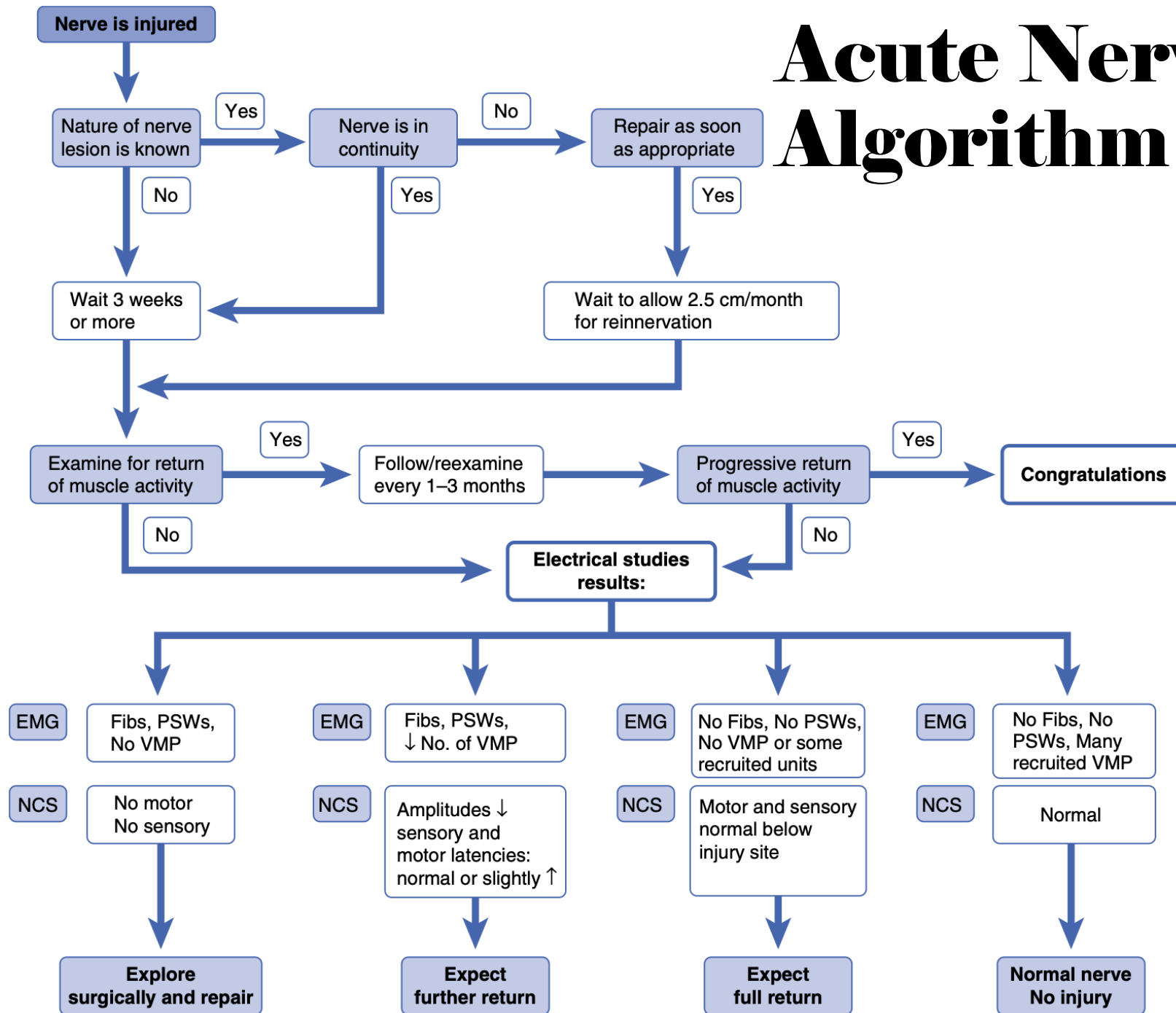
# Compressive Neuropathy Algorithm

- Likely chronic, obtain the Electrodiagnostic Study
- What the Electrodiagnostic Study will examine:
  - Fully testing the nerve in question
    - Above and below the suspected site
  - Comparison to other nerves
  - Ruling out alternative pathologies

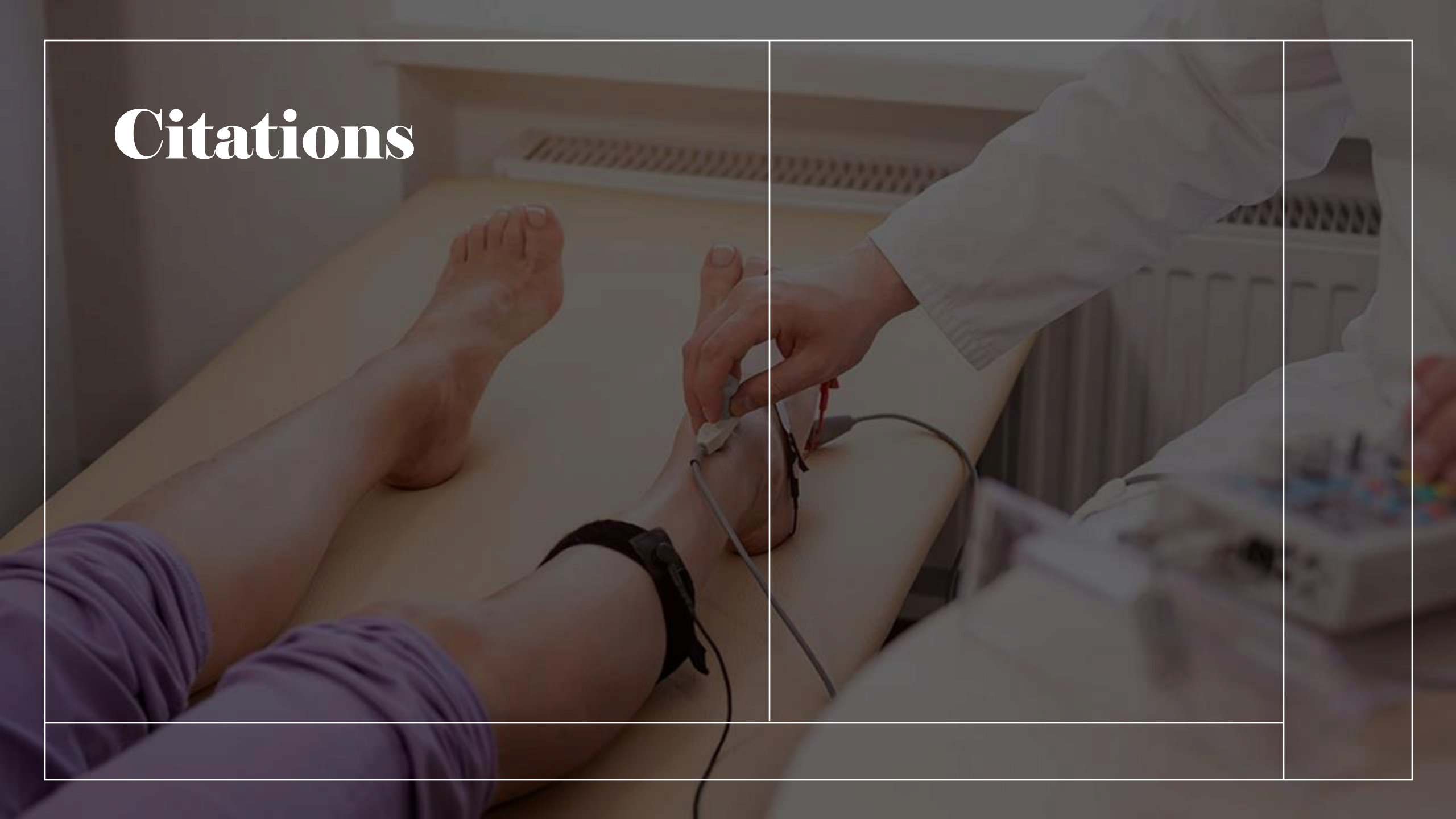


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# Acute Nerve Injury Algorithm



# Citations



# Citations

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- Willmott AD, White C, Dukelow SP. Fibrillation potential onset in peripheral nerve injury. *Muscle Nerve*. 2012 Sep;46(3):332-40. doi: 10.1002/mus.23310. PMID: 22907222.

# Questions?

A photograph of a person's leg lying on a light-colored surface. A black blood pressure cuff is wrapped around the lower calf. A medical professional, wearing a white lab coat, is adjusting a small white sensor on the person's ankle. The sensor is connected to a thin black cable. The background is slightly blurred, showing a white wall with a vent.

Thank you for your time and attention.